

Claims

- [c1] 1. An under-ball metallic layer structure over a contact pad such that the contact interface between the under-ball metallic layer and the contact pad is made from a material containing copper, the structure comprising:
an adhesion layer over the contact pad, wherein the adhesion layer is made from titanium-tungsten;
a barrier layer over the adhesion layer; and
a wettable layer over the barrier layer.
- [c2] 2. The structure of claim 1, wherein material constituting the barrier layer is a nickel-vanadium layer.
- [c3] 3. The structure of claim 1, wherein material constituting the wettable layer is selected from a group consisting of copper, palladium and gold.
- [c4] 4. The structure of claim 1, wherein the adhesion layer has a thickness between about 800 Å to 2000 Å.
- [c5] 5. The structure of claim 1, wherein the barrier layer has a thickness between about 1500 Å to 3500 Å.
- [c6] 6. The structure of claim 1, wherein the wettable layer has a thickness between about 2000 Å to 9000 Å.
- [c7] 7. An under-ball metallic layer structure over a contact pad such that the contact interface between the under-ball metallic layer and the contact pad is made from a material containing copper, the structure comprising:
an adhesion layer over the contact pad, wherein the adhesion layer is made from chromium;
a barrier layer over the adhesion layer; and
a wettable layer over the barrier layer.
- [c8] 8. The structure of claim 7, wherein material constituting the barrier layer is a nickel-vanadium layer.
- [c9] 9. The structure of claim 7, wherein material constituting the wettable layer is

selected from a group consisting of copper, palladium and gold.

- [c10] 10. The structure of claim 7, wherein the adhesion layer has a thickness between about 800 Å to 2000 Å .
- [c11] 11. The structure of claim 7, wherein the barrier layer has a thickness between about 1500 Å to 3500 Å .
- [c12] 12. The structure of claim 7, wherein the wettable layer has a thickness between about 2000 Å to 9000 Å .
- [c13] 13. A chip structure having bumps thereon, comprising:
a silicon chip having an active surface with a passivation layer and a plurality of bonding pads thereon, wherein the passivation layer exposes the bonding pads and material forming the bonding pads contains copper;
an adhesion layer over the bonding pads, wherein material forming the adhesion layer is titanium-tungsten alloy;
a barrier layer over the adhesion layer, wherein material forming the barrier layer is nickel-vanadium alloy;
a wettable layer over the barrier layer, wherein material forming the wettable layer includes copper; and
a plurality of solder blocks over the wettable layer.
- [c14] 14. The chip structure of claim 13, wherein the adhesion layer has a thickness between about 800 Å to 2000 Å .
- [c15] 15. The chip structure of claim 13, wherein the barrier layer has a thickness between about 1500 Å to 3500 Å .
- [c16] 16. The chip structure of claim 13, wherein the wettable layer has a thickness between about 2000 Å to 9000 Å .
- [c17] 17. A chip structure having bumps thereon, comprising:
a silicon chip having an active surface with a passivation layer and a plurality of bonding pads thereon, wherein the passivation layer exposes the bonding pads and material forming the bonding pads contains copper;
an adhesion layer over the bonding pads, wherein material forming the

adhesion layer is chromium;
a barrier layer over the adhesion layer, wherein material forming the barrier layer is nickel-vanadium alloy;
a wettable layer over the barrier layer, wherein material forming the wettable layer includes copper; and
a plurality of solder blocks over the wettable layer.

[c18] 18. The chip structure of claim 17, wherein the adhesion layer has a thickness between about 800 Å to 2000 Å .

[c19] 19. The chip structure of claim 17, wherein the barrier layer has a thickness between about 1500 Å to 3500 Å .

[c20] 20. The chip structure of claim 17, wherein the wettable layer has a thickness between about 2000 Å to 9000 Å .

[c21] 21. A chip structure having bumps thereon, comprising:
a silicon chip having an active surface with a passivation layer and a plurality of bonding pads thereon, wherein the passivation layer exposes the bonding pads and material forming the bonding pads contains copper;
an adhesion layer over the bonding pads, wherein material forming the adhesion layer is titanium-tungsten alloy;
a barrier layer over the adhesion layer;
a wettable layer over the barrier layer; and
a plurality of solder blocks over the wettable layer.

[c22] 22. The chip structure of claim 21, wherein material constituting the barrier layer is nickel-vanadium alloy.

[c23] 23. The chip structure of claim 21, wherein material constituting the wettable layer is selected from a group consisting of copper, palladium and gold, and that the solder block material and the wettable layer material may diffuse into each other.

[c24] 24. The chip structure of claim 21, wherein material forming the passivation layer includes polyimide.

- [c25] 25. The chip structure of claim 21, wherein the adhesion layer has a thickness between about 800 Å to 2000 Å .
- [c26] 26. The chip structure of claim 21, wherein the barrier layer has a thickness between about 1500 Å to 3500 Å .
- [c27] 27. The chip structure of claim 21, wherein the wettable layer has a thickness between about 2000 Å to 9000 Å .
- [c28] 28. A chip structure having bumps thereon, comprising:
a silicon chip having an active surface with a passivation layer and a plurality of bonding pads thereon, wherein the passivation layer exposes the bonding pads and material forming the bonding pads contains copper;
an adhesion layer over the bonding pads, wherein material forming the adhesion layer is chromium;
a barrier layer over the adhesion layer;
a wettable layer over the barrier layer; and
a plurality of solder blocks over the wettable layer.
- [c29] 29. The chip structure of claim 28, wherein material constituting the barrier layer is nickel-vanadium alloy.
- [c30] 30. The chip structure of claim 28, wherein material constituting the wettable layer is selected from a group consisting of copper, palladium and gold, and that the solder block material and the wettable layer material may diffuse into each other.
- [c31] 31. The chip structure of claim 28, wherein material forming the passivation layer includes polyimide.
- [c32] 32. The chip structure of claim 28, wherein the adhesion layer has a thickness between about 800 Å to 2000 Å .
- [c33] 33. The chip structure of claim 28, wherein the barrier layer has a thickness between about 1500 Å to 3500 Å .
- [c34] 34. The chip structure of claim 28, wherein the wettable layer has a thickness

~~between about 2000 Å to 9000 Å .~~

[c35] 35. An under-ball metallic layer on a contact pad made from copper, wherein the contact interface between the under-ball metallic layer and the contact pad is made from titanium-tungsten alloy.

[c36] 36. An under-ball metallic layer on a contact pad made from copper, wherein the contact interface between the under-ball metallic layer and the contact pad is made from chromium.

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